

TINY HOUSE

DESIGN & CONSTRUCTION GUIDE

YOUR GUIDE TO BUILDING A MORTGAGE FREE,
ENVIRONMENTALLY SUSTAINABLE HOME

2nd EDITION



DAN LOUCHE

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Photography: Dan Louche
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BOOK PREVIEW

Included are several sample sections from the Tiny House Design & Construction Guide, 2nd Edition. They are pulled from different parts of the book.

The table of contents for the full book is included, followed by a few excerpts.

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Building your own tiny house is an achievable dream!

INTRODUCTION



My Mom's House

In August 2009 I received an unsettling call from my mother. The poorly constructed trailer home she was living in was beginning to deteriorate around her. Water lines had been leaking for some time and mold was growing rampant. Living under these conditions was causing her health to deteriorate, but neither she nor I had the money to purchase a conventional house or even a new trailer home. So I started researching our options. I had always been interested in smaller homes, but up until this point, I had no idea there was an entire movement around tiny living. Once I discovered it, I was hooked. I began building my mother a tiny house of her own in September 2009.

After the house was complete and my mother had moved in, I was amazed by the level of joy that it brought her. Her excitement was contagious as others who had previously been skeptical of tiny living were now genuinely considering the possibility of living in a tiny house themselves. When I saw this reaction, I knew that I wanted to help others experience a similar level of happiness and independence. I founded Tiny Home Builders and have been sharing my knowledge on tiny houses ever since.

I imagine, since you are reading this book, you too are excited about the possibilities that a tiny house can bring; the financial freedom of not having a mortgage, the freedom to move as you desire and to take your house with you, and finally the freedom of a simpler life. I hope you find answers and inspiration in these pages and realize that building your own tiny house is an achievable dream.

Before beginning construction, you will want to start preparing to make the transition to your new house

PREPARING TO LIVE TINY

DOWNSIZING

To be comfortable in a tiny house you are likely going to have to downsize your belongings. It is better to do this well before moving into your new house so that you have time to purposefully decide what you will keep and what you will get rid of. Downsizing is not something that should be done as part of your move. It is a journey and not a weekend task. This process should be started at least 3 months prior to moving, but there is no need to wait until then. There are many benefits to downsizing other than just being able to fit into your new home.

This process can be easier for some and harder for others, but since you are considering a tiny house you are likely already inclined to living with and wanting less.

The first step to downsizing is to identify what is important to you and what makes you happy. If there is something that you use everyday or if it brings you joy, then you will need to find a place for it in your new home. Do not abandon the activities that make you happy because you do not think they will fit. For other items that are used less frequently, you will need to evaluate how much value they provide to your life. This process can be difficult since you will need to differentiate between actual value and perceived value.

Hobbies and all of the supplies that come with them are a great example of where some of these difficult decisions may arise. If you have a hobby that you actively participate in and really enjoy, then you will want to carve out space for it in your new home. However, just having the supplies for an activity does not make it your hobby. Often times, people will hang on to belongings that represent who they want to be or what they would do if they had more time. They hold on to these things so that they are ready to become who they want to be, but often that never comes and the stuff becomes a source of stress rather than inspiration. These items act as a reminder of all the things they never had time to do or learn.

The easiest things to get rid of when downsizing is the stuff you do not use. We all have items that we either used in the past or purchased because we thought we would use them, but never did. If you do not use it, you do not need it. You may try to convince yourself that you will indeed use it someday and that is why it is worth hanging onto.

So, how do you identify what you no longer use? For most stuff, if you are honest with yourself, it should be pretty straightforward. There are, however, some items that are just harder to track. With clothing for instance it can be hard to remember the last time you wore something. A simple technique for this is to hang all your clothes backwards in your closet so that the open part of the hook on the clothes hanger is facing you. Then every time an item is worn and washed you hang it back up with the hook turned in the conventional direction. After a certain period of time, you identify what has not been worn by looking at the hook direction. Since what we wear is seasonal, this process can take up to a year.

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Headers above openings are only required in load-bearing walls. We will cover how to construct a header in the chapter on Framing.

If the load path is not consistent, then deflection can occur. Deflection is when the framing members bend under a load. If the deflection is too much and the framing member fails, then the structure can partially or fully collapse. Even a small amount of deflection can cause problems like cracks in walls, bulging windows, and difficult to open doors and windows.

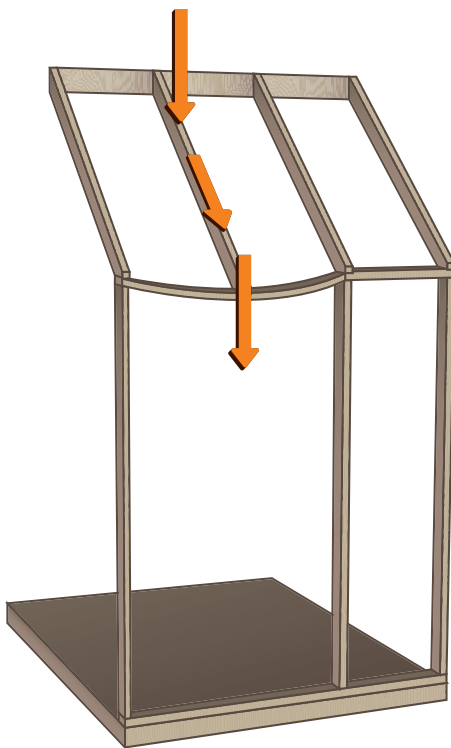
The diagram to the right illustrates how studs are used in a wall to provide support.

LOAD-BEARING CANTILEVERS

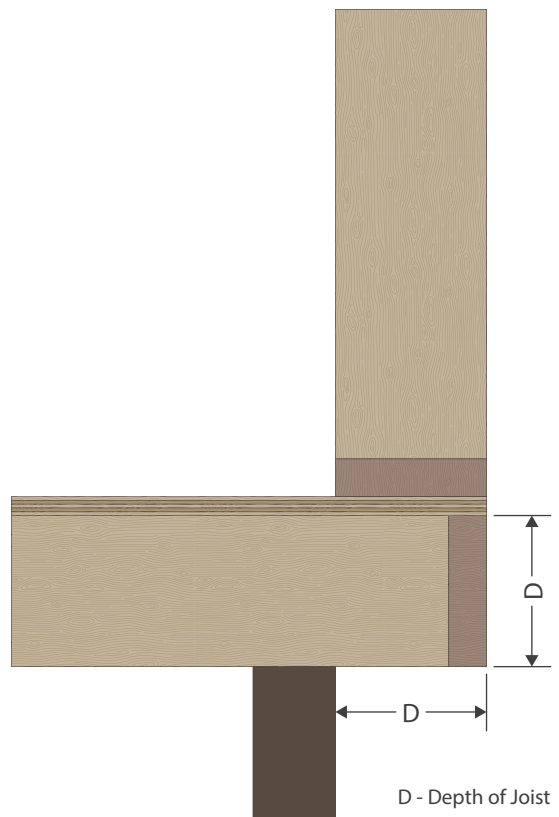
A tiny house is often wider than the trailer that it is built on. When this occurs, the house subfloor will cantilever, or overhang the edge of the trailer. Because the subfloor then supports the walls of your house, it is considered a load-bearing cantilever. Load-bearing cantilevers should extend or overhang no more than the depth of the floor joist.

ADVANCED FRAMING TECHNIQUES

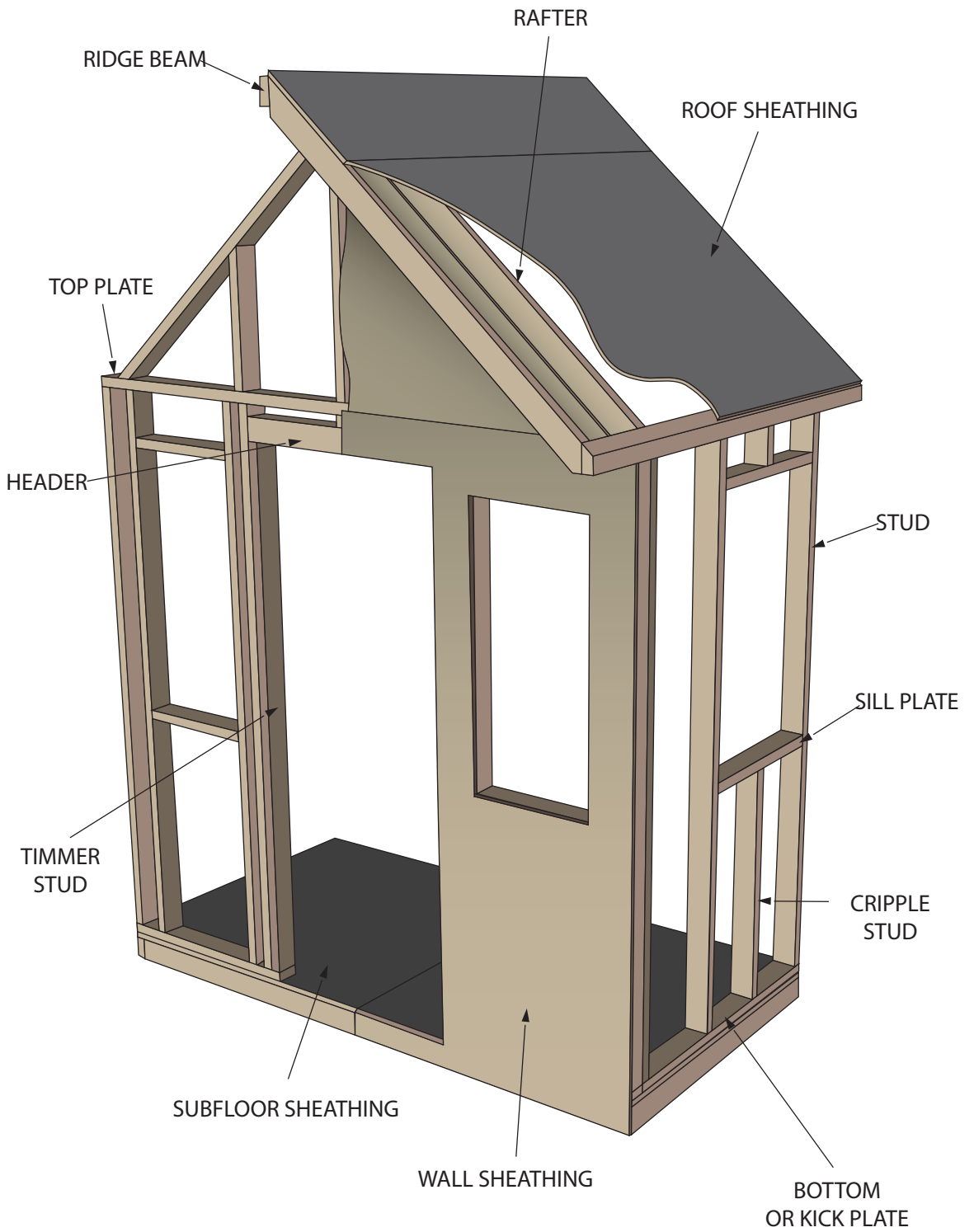
In recent years, framing methods have improved to make houses more energy efficient. These changes are called 'Advanced Framing Techniques'. The use of the term 'Advanced'



Deflection



Load-Bearing Cantilevers



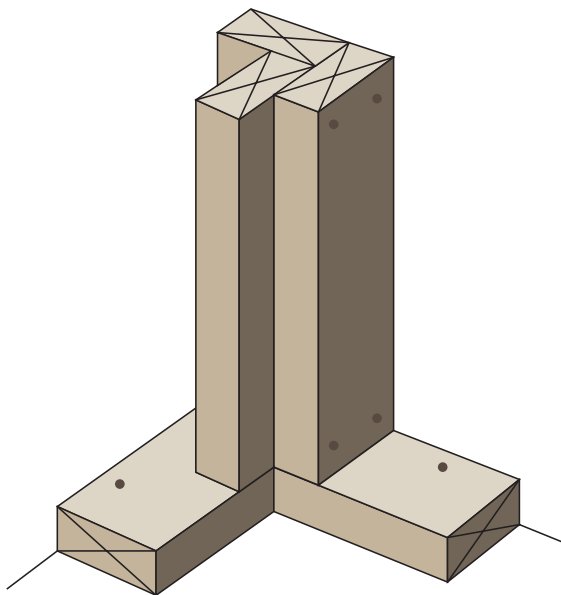
is a bit misleading, as these methods are no more difficult to implement than 'Standard' framing. They are new ways to frame that reduce the amount of wood in a wall, increase the amount of insulation, and ensure that no 'pockets' are created that can be difficult to insulate. While not all Advanced Framing Techniques are applicable to tiny houses, there are some significant improvements that do apply, including:

24 INCH ON-CENTER STUDS. Studs in a house are generally placed either 16 or 24 inches apart from their centers (called on-center). Since the wood that studs are made of is not a good insulator, it is desirable to have the minimum number of them in your wall as possible while still providing sufficient support. For a smaller structure like a tiny house, 24 inches apart is adequate.

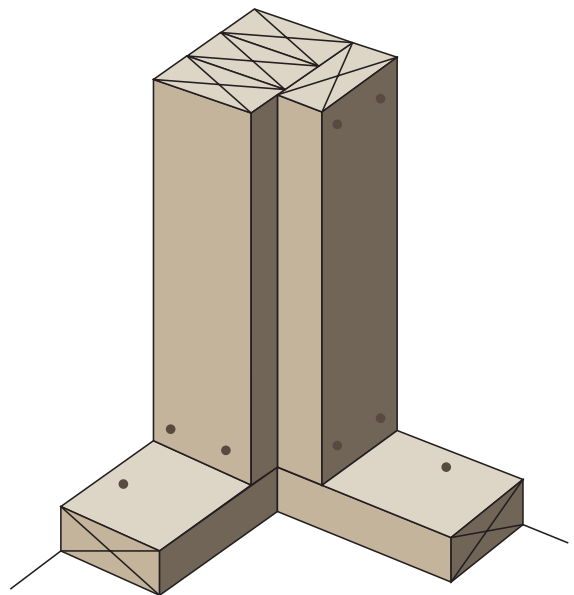
SINGLE TOP PLATE. Older framing methods utilize two top plates in a wall to support the weight of any rafters that may be located between the studs. The two top plates act as a form of header. However, by lining up the rafters so they make contact with the top plate at the same location the studs make contact, the weight of the roof is transferred directly to the studs and only a single top plate is required.

IMPROVED CORNER DESIGN. In older framing, the corners involved more wood and the way they were constructed actually created a hidden pocket that, unless drilled into and injected with insulation, would often go uninsulated. The new design uses less wood and is easily insulated.

3 Stud Corner



4 Stud Corner



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Getting the right trailer for your design is important, as it is the foundation of your house

TRAILER

07

TRAILER TYPES

Trailers are generally categorized by what they will be used to haul. While there are no industry standards that define these categories, you will often find trailers that are best suited for tiny houses referred to as either equipment trailers or car haulers. There are also trailers designed specifically for tiny houses which come ready to be built on.

UTILITY TRAILER

Utility trailers are lighter duty trailers typically used to move landscaping equipment or all-terrain vehicles. They usually feature side rails and a large ramp at the back to facilitate loading and unloading equipment. Because of their smaller axles and thinner steel, this trailer type is not suitable for a tiny house.

EQUIPMENT TRAILER

Equipment trailers are heavy duty trailers typically used to move heavy equipment like tractors. Variants of these designed specifically to move cars are called Car Haulers. Because of their heavy duty axles and thicker steel, these trailers are often used as tiny house foundations.



Utility Trailer



Equipment Trailer

DECKOVER TRAILER

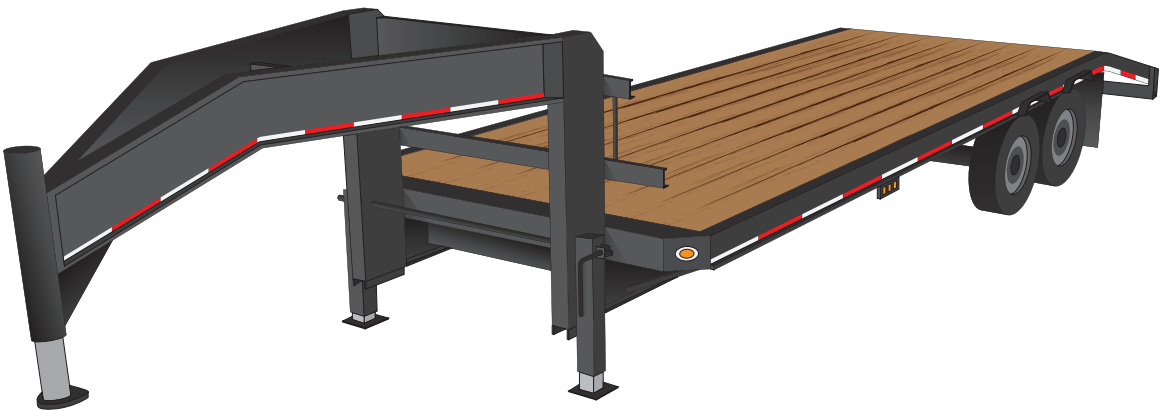
Deckover trailers are very similar to equipment trailers. The main difference is that with deckover trailers, the deck is raised above the fenders allowing the top surface to be completely flat. While a flat surface may seem appealing for the purpose of building a house, the tradeoff is that this reduces the interior height of your home, since there is an overall height limit of 13 ½ feet. The height difference between a standard equipment trailer and a deckover is typically around one foot. Therefore, this trailer type would only be suitable for a house without a sleeping loft. Also be aware that raising the deck height will also add 2 additional steps leading to the house.

GOOSENECK TRAILER

A gooseneck trailer is also very similar to an equipment trailer. The main difference between the two is the hitch. A gooseneck trailer has a much larger hitch assembly that is raised up and attaches to a special receiver installed inside the bed of a truck. If you are familiar with RV's, a 'fifth wheel' trailer has a gooseneck. Gooseneck trailers require a larger tow vehicle, with an expensive receiver installed. The tradeoff is that they can carry more weight and can be easier to tow. Gooseneck trailers are not commonly used for tiny houses since they have a different aesthetic to them that is typically associated with RV's.



Deckover Trailer



Gooseneck Trailer



Tiny House Trailer

TINY HOUSE TRAILER

A tiny house trailer is a trailer specifically designed to be built on. It has features that will make that job easier and will not require the preparation needed when using an equipment trailer.

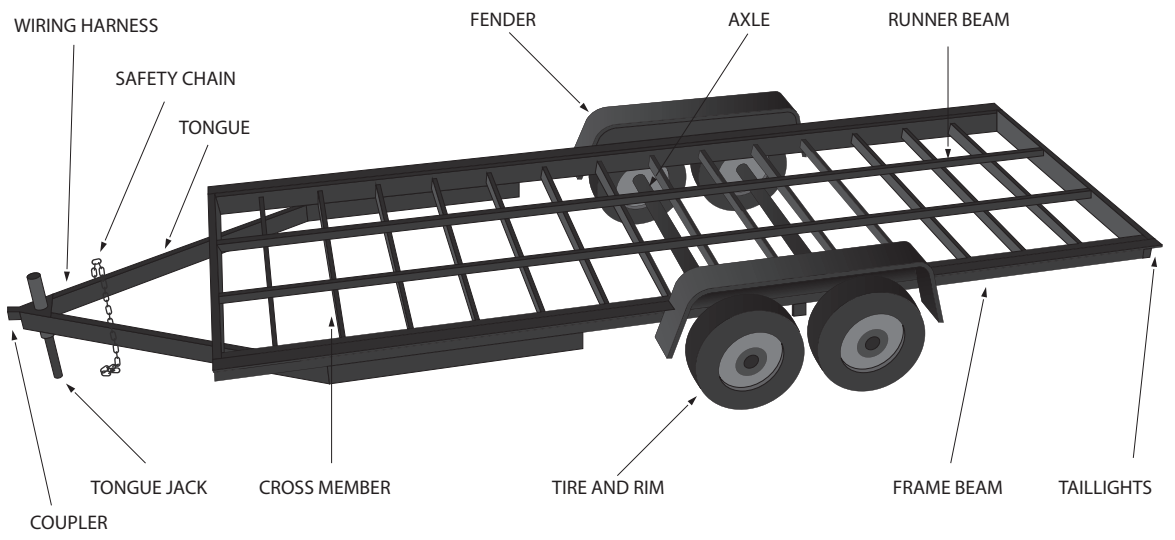
ACQUIRING A TRAILER

When shopping for a trailer, it is helpful to know the names of the various parts. See the diagram to the right for the location of the different components.

A trailer can be purchased either new or used. For a used trailer, I suggest checking Craigslist and local trailer dealers. In my experience, however, I have not found there to be a substantial price break in used trailers unless they required significant restoration work. Considering that the trailer is the foundation of the house, it is important that there are no issues with it. These potential drawbacks, coupled with the customizations that can be made to a new trailer, I recommend buying new.

TRAILER FEATURES

Trailer manufacturers add features to their trailers specifically to aid in the job that they are intended to perform. For example, if a trailer is made to transport a car, it needs to



Trailer Diagram



Trailer Tongue

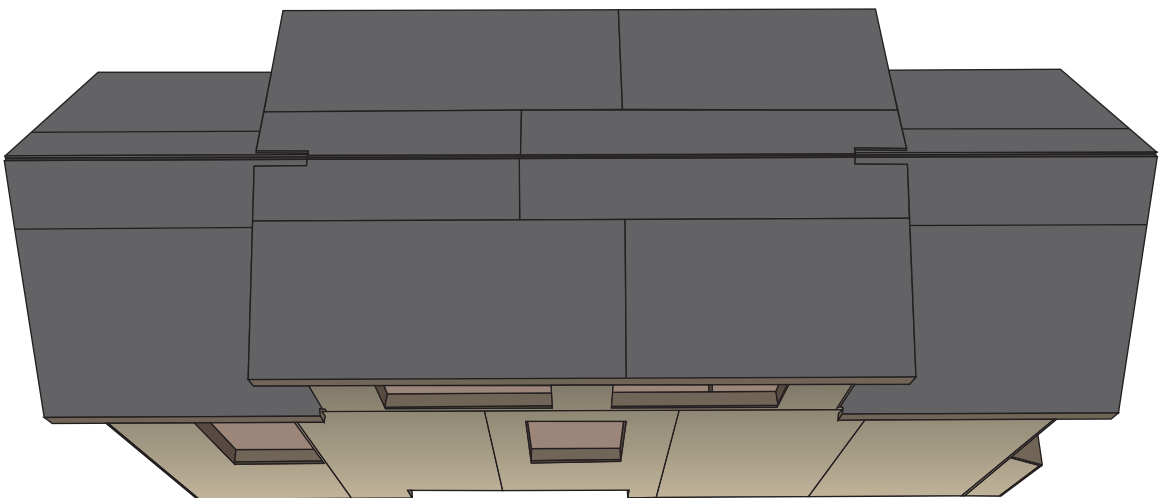
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The roof sheathing is installed very similarly to the wall sheathing

ROOF SHEATHING

Like the wall sheathing, the roof sheathing material is 15/32 inch plywood and is attached with construction adhesive and 2 inch exterior screws. If the rafters are 24 inches apart, plywood clips, also known as H clips, should be placed between the horizontal seams of any two adjoining sheets and centered in the area between the rafters. The grains of the plywood sheets should be perpendicular to the rafters for strength, with the long side of the sheet parallel to the ground. Stagger the seams so that a lower sheet's seam does not line up with any adjoining upper sheet's seam on the same rafter.

Install temporary blocks along the bottom edge of the roof to prevent the plywood sheets from sliding off while you are putting them in place. These also ensure that the plywood will be even with the bottom edge of the roof. Blocks can be made of scrap material, including small pieces of plywood or 2x4s. They should only extend above the edge of the roof about one to two inches; otherwise, they may get in the way and make it more difficult to lift the sheathing into place. Cut a sheet of plywood to the size required and mark the rafter locations to assist with screw placement later. Apply construction adhesive on the rafters that the sheathing will lay on and put the sheet in place. If construction adhesive gets on any part of a rafter that will not get covered by sheathing in a relatively short period of time, be sure to clean it off before it hardens. Removing hardened adhesive is considerably more difficult than removing it when it is fresh and wet.





Roof Sheathing Ready to be Slid into Place

If working alone, consider using smaller pieces of sheathing. Smaller pieces will often result in more waste, but are also a lot easier and safer to move, especially while on a ladder.

A technique to get larger pieces of sheathing up on a roof is to use an extension ladder. The ladder is positioned to lean against the roof at a relatively gentle angle. The sheathing is centered at the bottom of the ladder and slid up as you walk up the ladder behind it. The sheathing is pushed up until it slides off the top of the ladder and on to the rafters. If this technique is used, care should be taken so that the base of the ladder does not lift off of the ground when the sheathing gets to the top, as this can result in the ladder sliding and falling.

Once the sheet is in the proper location, attach it with 2 inch exterior screws. On the outside edges, the screws should be approximately 6 inches apart. On the inside rafters, they should be 12 inches apart. Offset the screws along the seams of adjoining pieces of sheathing.



Roof Sheathing in Place

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The material and profile of your siding greatly determines the final look and feel of your house

EXTERIOR SIDING

There are several different options for exterior siding on a tiny house. A popular siding material for tiny houses is cedar which is lightweight, durable and attractive. Cedar is also available in different profiles. While lap siding has a more traditional look, shiplap siding can have a more modern appearance. Different profiles are available in different regions based on the local styles, so visit your lumber mill to determine what is available. Many current residential applications of lap siding use HardiePlank®, which is made with a concrete material. While great for a traditional home, HardiePlank® is not suitable for a tiny house due to its heavier weight and somewhat brittle nature.

The trim and siding should be painted or stained on both sides prior to installing. This will increase the durability of the material by protecting the back side in the event that water gets behind it. It will also prevent unstained or unpainted portions of the boards from being exposed when the wood expands or contracts. Paints and stains are also more consistent when applied to a horizontal surface, as the material is less inclined to drip or run.

Next, mark the walls with horizontal lines to line up the top edge of each piece of siding. These lines are made by measuring up from the bottom edge of the house at the corners and then using a 'chalk line' to connect the measured points. It is important that each line be measured and marked from the same starting point, such as the bottom edge of the house, and not from a previous line or from the top edge of a previously installed piece of siding. If the measurements are not taken from the same starting point, it is possible



Trim and Siding Completed

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Many people have concerns about plumbing a tiny house, but it is actually one of the easier tasks

PLUMBING

PLUMBING COMPONENTS

The first step to learning about the plumbing system of a house is to understand the individual components. A plumbing system is composed of two different sections, the supply lines and the waste lines.

SUPPLY LINES

The supply lines, sometimes called distribution lines, bring fresh water into a house. For supply line plumbing material there are several different options including copper, PEX, and CPVC.



Plumbing Parts

COPPER

Copper has been used for plumbing the longest of all the materials listed. However, there are some distinct disadvantages to using copper in your tiny house.

First, copper is the most expensive of the materials listed. Since a tiny house will require so little plumbing material, this may not be a big concern with your budget. However, its higher value and ease of selling makes it very prone to theft. Thieves have been known to do thousands of dollars in damage just to get to a very small amount of copper. Also, because of its higher value some foreign manufacturers have been known to mix in other metals with the copper. This can result in the copper leaking, as the other metals corrode over time.

Copper is also harder to work with and install. It is very rigid which can make it difficult to route through walls. Any holes cut in the studs will need to line up precisely for the piping to fit through. Finally, copper also requires the most skill to assemble and it can take a bit of practice to become proficient at it.

Because of these negatives, we do not recommend using copper as your supply line piping material.

PEX (CROSS-LINKED POLYETHYLENE)

PEX is a newer plumbing material known for being highly flexible. It is less expensive than copper, but more expensive than CPVC.

In a conventional home, the flexibility of PEX can make for a much easier installation and result in fewer fittings, which are the pieces that hold the piping together. In a tiny house, however, the plumbing is very limited and confined. That amount of flexibility is not as useful or needed.

PEX is very easy to install and work with, although it requires a specialized tool that costs approximately \$70 to connect the piping to the fittings.

While PEX has several advantages over copper, its biggest advantage of being highly flexible is lost on tiny houses.

CPVC (CHLORINATED POLY (VINYL) CHLORIDE)

CPVC is both inexpensive and easy to work with.

While not as flexible as PEX, CPVC is flexible enough to bend slightly within the walls making installation easy. The pipes are also easy to cut and join using a specialized liquid cement. CPVC will not corrode and is suitable for higher temperature water. For these reasons, CPVC is the recommended plumbing material.



Copper Piping



PEX Piping



CPVC Piping



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Electrical is a large, detailed topic. Fortunately, only a very small subset of knowledge on the subject is required to wire a tiny house

ELECTRICAL

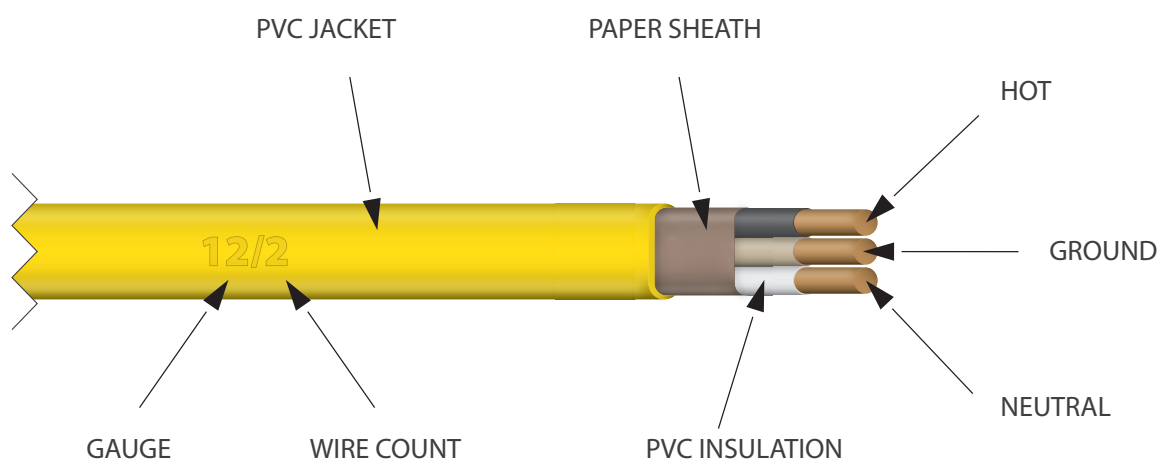
ELECTRICAL COMPONENTS

Just like with the plumbing system, the first step to learning about the electrical system of a house is to understand the individual components.

WIRE

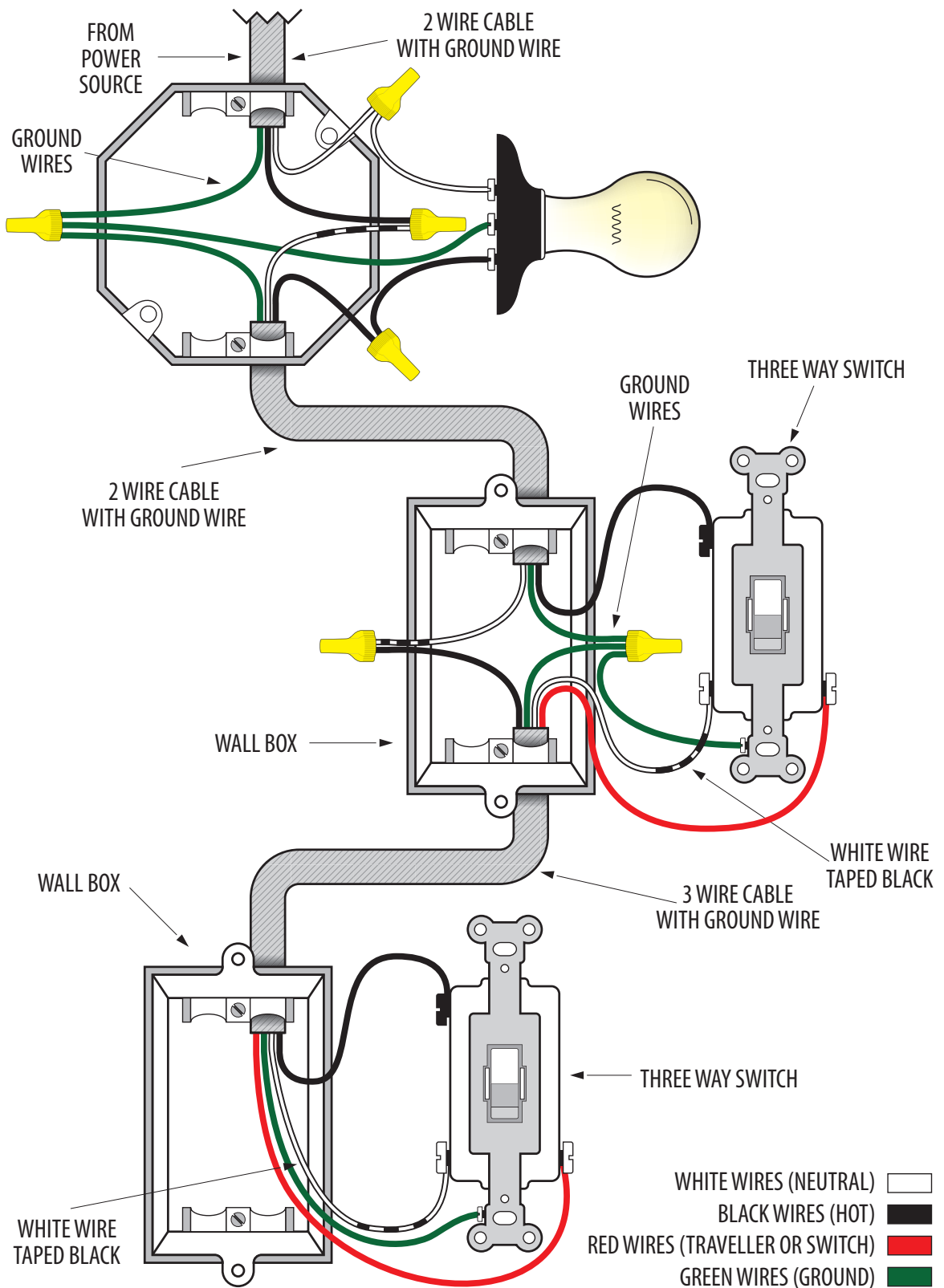
Residential wiring, sometimes called by the brand name Romex®, is sheathed to protect it in the walls of the house. It comes in different gauges, or thicknesses, as well as having a different number of wires within the sheathing. The product packaging will indicate these two items, separated by a slash. For instance, wire that is 12 gauge and has two wires plus the ground wire within the sheathing is called '12/2' wire. The type and number of electrical devices connected to a circuit determines the gauge of the wire that should be used. Please note, the smaller the gauge number, the thicker the wire. In a typical tiny house, 12 gauge wire can be used throughout. Standard outlets and switches require only 2 wires, plus the ground, in the sheathing. 3-way switches require 3 wires.

The diagram below illustrates a '12/2' wire, where there are 2 individually sheathed wires in addition to the ground wire, which is just bare copper. The white wire is the neutral wire and the black wire is the hot wire. The ground wire and the neutral wire are closely related, as they are both connected to the earth at some point. For safety reasons they are kept separate throughout the entire system until they are joined together in the main breaker box or panel. The hot wire is the wire that has electric potential relative to the ground and neutral wires, so it is the one that can shock you. In unique circumstances, the ground and neutral wires can also shock you, so always use caution. Fortunately, when working on the electrical system of a tiny house it is simple to disconnect it from its power source to avoid getting shocked.



Sheathed Wire

Pages 142-148 are not included in this book preview



3-Way Switch - Power Through Light

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